

WHAT IS CLAIMED IS :

1. Method for the estimation of one or more parameters of a propagation channel with a priori knowledge of the signal in a system comprising one or more sensors, wherein the method comprises the following steps:

- 5       • correlating the signal or signals  $x(t)$  received by the sensor or sensors with a known signal  $c(t)$ ,
- sampling said signal after correlation at a sampling period  $T_e$  and selecting a number of samples per concatenation,
- determining at least one parameter of the propagation channel such as  $\tau$
- 10     and/or  $\theta$  which enables the most efficient reconstruction of the signals received by using a maximum likelihood method.

2. A method according to claim 1, wherein the characteristics of the system of sensors are known and wherein:

- the known signal  $c(t)$  is equal to 1,
- 15   • the signals received on the antenna are expressed in the form  $X=S(\tau, \theta)h+B$
- the estimates of the parameters  $\tau$  and  $\theta$  are expressed in the following form:

$$\begin{aligned}\hat{\theta}, \hat{\tau} &= \arg \min_{\theta, \tau} \|\Pi_S^\perp(\theta, \tau)X\|^2 \\ &= \arg \min_{\theta, \tau} \{X^T \Pi_S^\perp(\theta, \tau)X\}\end{aligned}$$

20       where  $\Pi_S^\perp$  is the projector orthogonal to the image generated by the column vectors of  $S(\theta, \tau)$ .

3. A method according to one of the claims 1 or 2, comprising a step for determining the complex amplitudes  $h$  of the impulse response of the propagation channel from the estimates of the estimated parameters  $\tau$  and  $\theta$ .

25       4. A method according to claim 1 wherein the characteristics of the system of sensors are not known, and the method comprises for example:

- a step for the correlation of the signals received by the network of sensors with a known signal  $c(t)$  equal to 1,
- concatenated form  $Y = \psi(\tau)\alpha+N$  where  $\psi(\tau)$  is equal to the convoluted
- 30     product of the unit matrix  $I_N$  and the matrix  $S(\tau) = [s^1(\tau_1^1), \dots, s^1(\tau_{A_1}^1), \dots, s(\tau_{P_U}^U)]$
- and  $\alpha$  contains the responses of the paths of the different users,
- a step for the estimation of the delay vectors  $\tau$  from

$$\begin{aligned}\hat{\tau} &= \arg \min_{\tau} \|\Pi_\psi^\perp(\tau)Y\|^2 \\ &= \arg \min_{\tau} \text{tr}(Y^T \Pi_\psi^\perp(\tau)Y)\end{aligned}$$

where  $\Pi^\perp_\tau$  is the projector orthogonal to the image generated by the line vectors of  $\psi(\tau)$ .

- 5 5. A method according to claim 1 comprising a step of correlation of the signals with a signal  $c(t)$  different from 1, wherein the characteristics of the system of sensors are known and this correlation step comprises a step for the estimation of the parameters  $\tau$  and  $\theta$  from

$$\theta, \tau = \arg \min_{\theta, \tau} X^w R_b^{-1} \Pi_\Phi^\perp(\theta, \tau) X^w$$

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$$\Pi_\Phi^\perp = I - \Phi(\theta, \tau) (\Phi^\dagger(\theta, \tau) R_b^{-1} \Phi(\theta, \tau))^{-1} \Phi^\dagger(\theta, \tau) R_b^{-1}$$

6. A method according to claim 1, comprising a step of correlation of the signals with a signal  $c(t)$  different from 1 wherein, the characteristics of the system of sensors being unknown, the estimation of the delay vector is expressed by means of:

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$$\hat{\tau} = \arg \min_{\tau} Y^w R_n^{-1} \Pi_s^\perp(\tau) Y^w$$

where

$$\Pi_s^\perp = I - S(\tau) (S(\tau) R_n^{-1} S(\tau))^{-1} S(\tau) R_n^{-1}$$

- 20 7 - A method according to one of the claims 1 to 6, applied in MIMO (Multiple Input Multiple Output) or SIMO (Single Input Single Output) type applications.

8. A device for estimating one or more parameters of a propagation channel with a priori knowledge of the signal in a system comprising one or more sensors, the device comprising at least:

- a device adapted to the correlation of the signal received by the sensor or  
25 sensors  $s(t)$  with a known signal  $c(t)$ ,
- a device adapted to the selection of a number of samples of the signal obtained after the correlation step, and
- a device adapted to the determining of the parameters of the channel by a maximum likelihood method.

- 30 9. A radiocommunications receiver comprising the characteristics of the device according to claim 8.